Swedish background

- Located at Baltic Sea
- Long history of war against Russia
- Charles XII tried to invade Russia (1709)
- Small population – many emigrated to USA
- Soviet invasion was the main treat during Cold War

Swedish armed forces today

- Invasion not considered a realistic threat
- Decreased budget
- Budget tied up by large investments → non-proportional reduction in military personnel
- International missions more and more important

Swedish international UN missions

- Several during cold war: Korea, Gaza, Congo, Lebanon, Cyprus
- During recent years: Bosnia, Kosovo, Dessert storm, Afghanistan, Congo
- A need for NLW has been recognized

Users of NLW in Sweden

- Police
  - Tasers , since 2004
  - Impact weapons - special teams
  - OC, some departments
- Military
  - No systems in use

NLW research at FOI – Swedish Defence Research Agency

- **High Power Microwaves**
  - Systems
  - Protection
  - Bioeffects
- **Impact weapons**
  - Systems
  - Bioeffects of blunt trauma

Nervous System

No acute change in structure
No change in blood-brain barrier function
Long term effects unknown

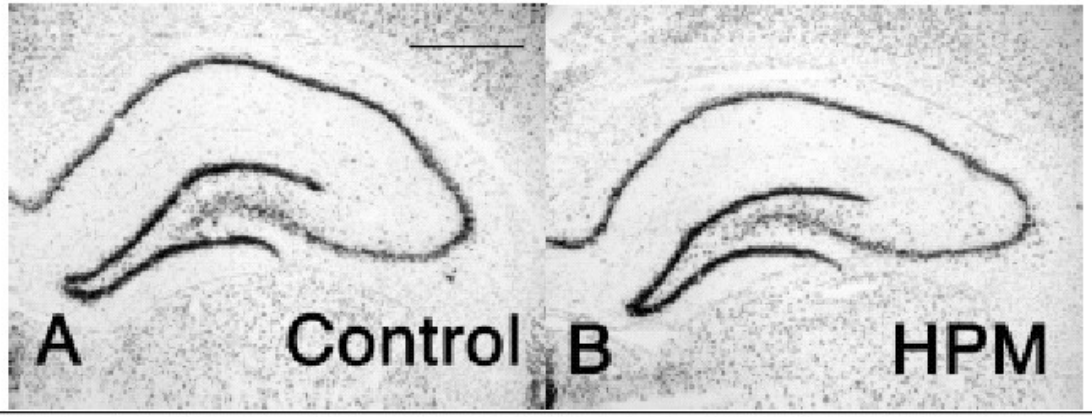
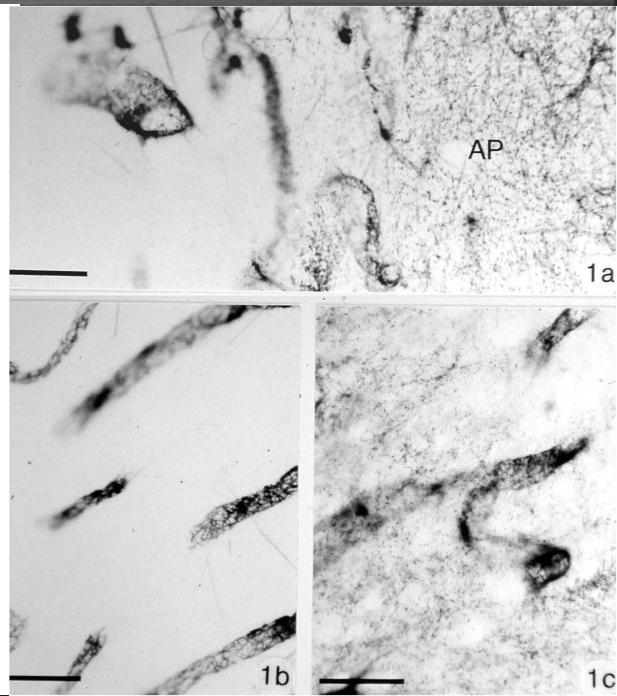
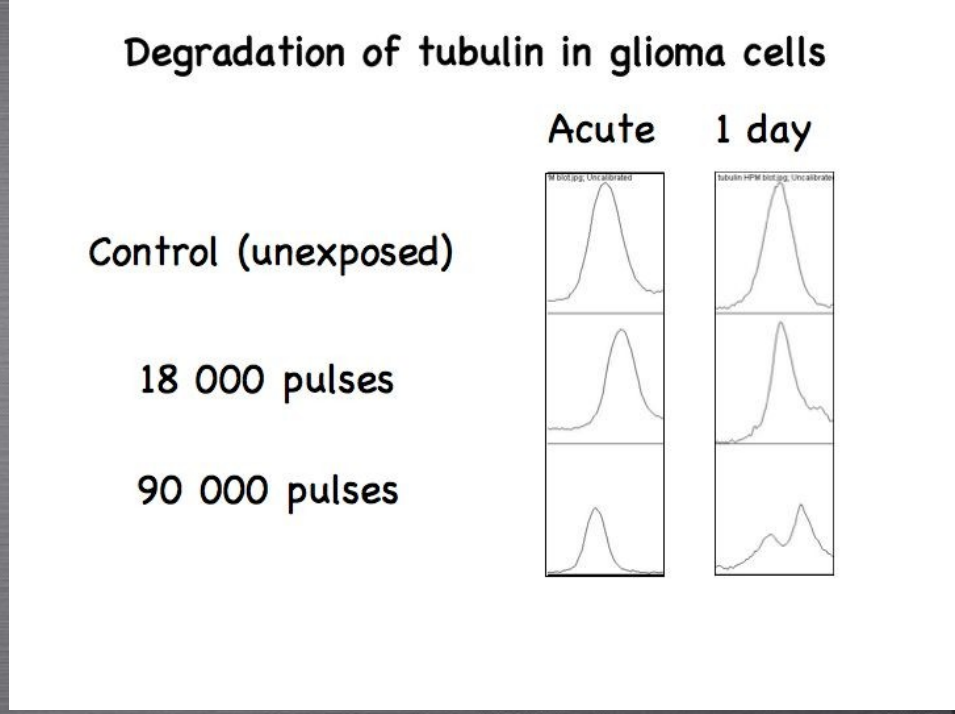


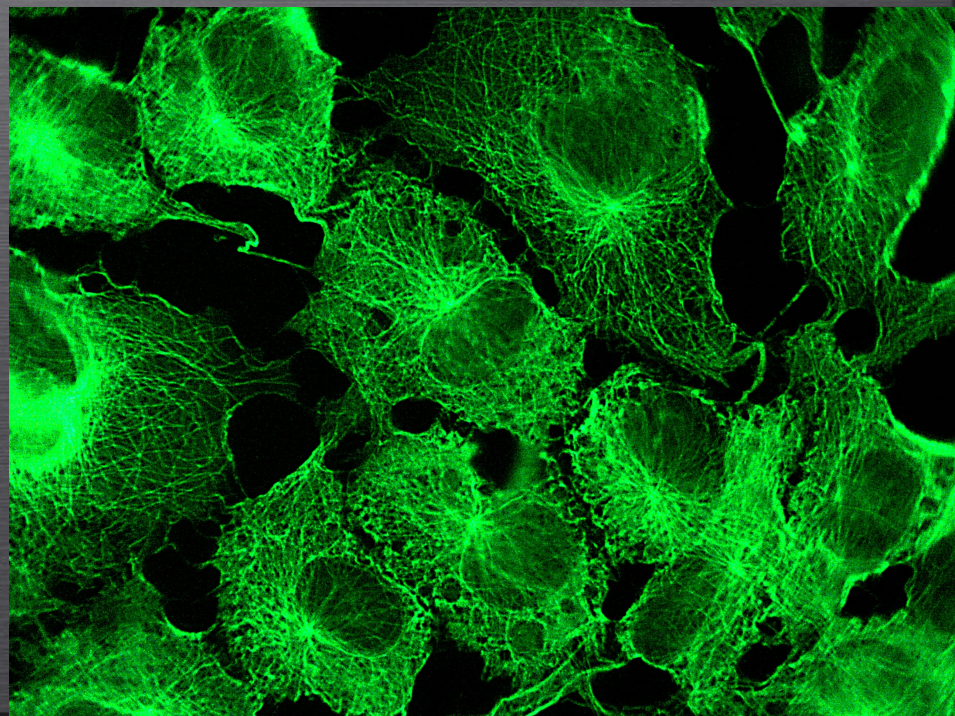
Fig. 2. Micrographs showing sections through the hippocampus of a sham exposed (A) and a rat exposed to HPM for 60s. The sections were hybridized with an oligonucleotide probe complementary to alk 5 (transforming growth factor receptor I). Note that the intensity of the labeling and the configuration of the hippocampus is virtually the same in the two sections. The scale bar represents 0.5 mm.



Tubulin

- Filaments – cytoskeleton
- Of importance for cell structure and division
- Dynamic turnover



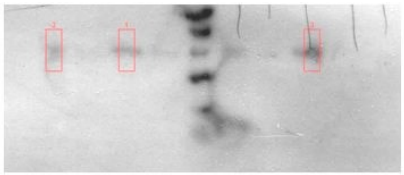


VEGF

Vascular Endothelial Growth Factor

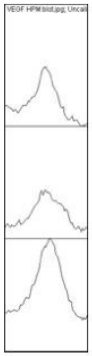
Regulates growth and survival of vascular cells and many nerve cells

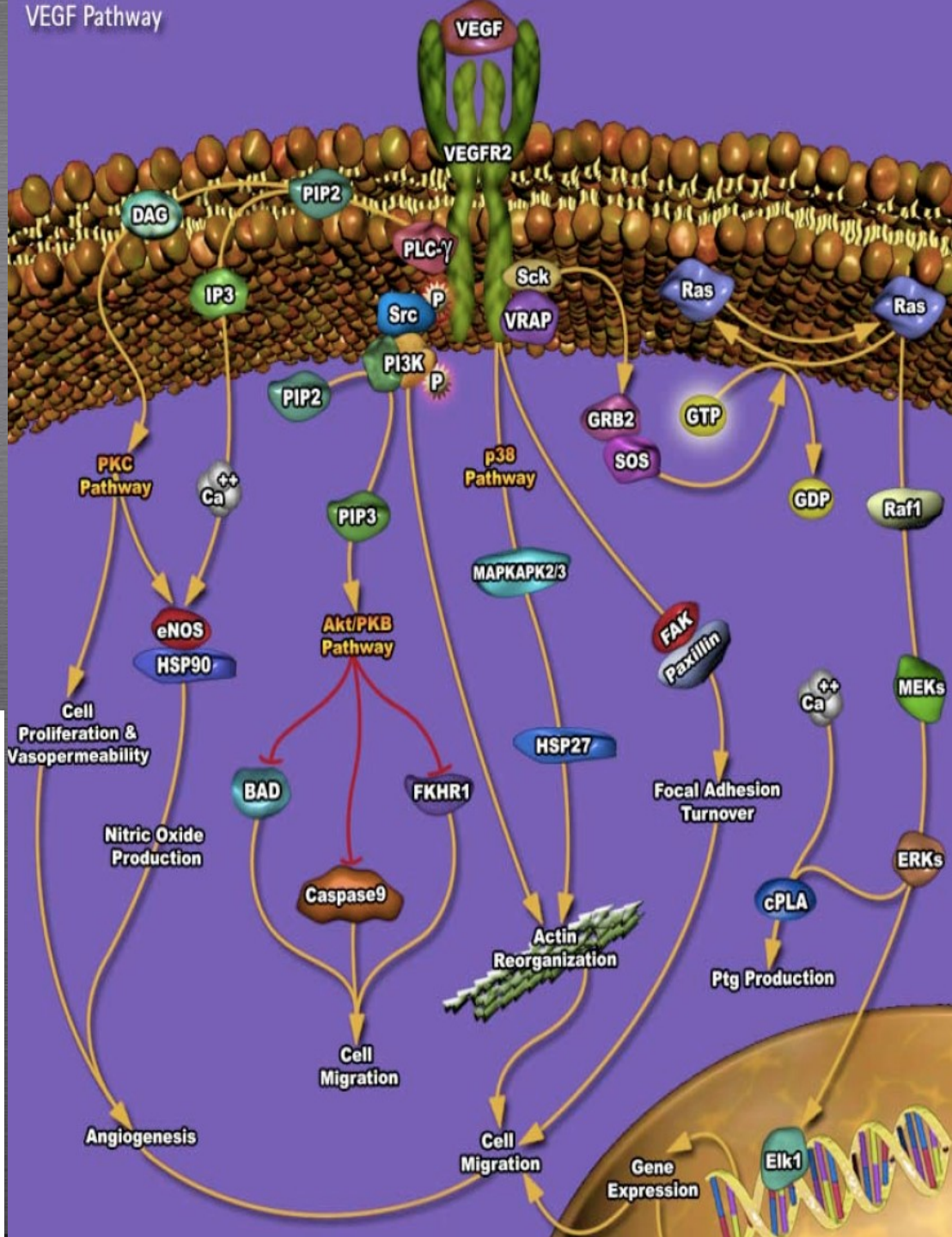
Induction of VEGF protein



C6 Glioma cells

Exposed for 18000 pulses of HPM at 22 kV/m





The number of pulses that are needed for effects on tubulin and VEGF are much higher than realistic use of HPM

Examples of collaboration

- European Working Group – NLW
- Cepa (microwaves)
- NATO (HFM 073)

2nd Virtual Working Group

- **Mårten Risling**, Experimental traumatology, FOI, Sweden
- **Valeri Khrupkin,** State Institute for postgraduate training and advanced experience of military doctors, Moscow, Russia
- **Stanislaw Szmigielski,** Department of Microwave Safety, Military Institute of Hygiene and Epidemiology Warsaw, Poland
- **Dominique Loye,** Mines-Arms Unit, Legal Division,International Committee of the Red Cross
- **Donald A. Lund,** Justiceworks Institute for Policy and Social Science Research, University of New Hampshire, Durham, USA
- **Amy Truesdell,** Homeland Security Support Programs National Security Research, USA
- **Michael Murphy,** AFRL/HEDR Brooks city base, USA
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- **Ingrid Philippens,** CNS pharmacology Research Group Medical Countermeasures, TNO Defense, Security and Safety,The Netherlands
- **Ian Richard Grose,** Injury Modelling Team, Dstl Porton Down, UK
- **Eduard David,** Witten/Herdecke University, Germany